CLAIMS

WHAT IS CLAIMED IS:

1. In a system for presenting an audio stimulus having an input, an amplifier, an attenuator and a transducer, a method of predicting a sound pressure level emitted by the transducer comprising:

applying a broadband audio signal to the input;

inserting a first attenuation between the amplifier and the transducer;

measuring a first output from the transducer;

calculating a first transfer function for a signal path from the input to the measured first output;

inserting a second attenuation between the amplifier and the transducer;

measuring a second output from the transducer;

calculating a second transfer function for a signal path from the input to the measured second output;

combining the first and second transfer functions to solve for a characteristic impedance and sensitivity of the transducer;

calculating a sound pressure level emitted by the transducer as a function of input signal and attenuation.

2. The method of claim 1 further comprising measuring the broadband audio signal applied at the input simultaneously with measuring the first and second outputs from the transducer.

3. The method of claim 2 wherein the first and second transfer functions are calculated as respective ratios of the first and second measured outputs to the corresponding measured inputs.

4. The method of claim 3 wherein each of the first and second transfer functions is expressed as a product of an amplifier transfer function, an attenuator transfer function, an electrical-to-acoustical transfer function and an acoustical-to-electrical transfer function.

5. The method of claim 4 wherein the characteristic impedance of the transducer is calculated as:

$$Z_L(f) = \frac{H_{BD}(f,R_1,A,Z_L)\times R_1 - H_{BD}(f,R_2,A,Z_L)\times R_2}{H_{BD}(f,R_2,A,Z_L) - H_{BD}(f,R_1,A,Z_L)}.$$

6. The method of claim 5 wherein the sensitivity of the transducer is calculated as:

$$A(f) = \left| \frac{H_{BD}(f,R_1,A,Z_L)\times\left[Z_L(f)+R_1\right]}{H_{AMP}(f)H_{A2E}(f)\sqrt{Z_L(f)}} \right|.$$

7. The method of claim 6 wherein the sound pressure level is calculated as:

$$20\log_{10}\left(\sqrt{\frac{\sum_f \left| Y_X(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\bullet \frac{H_{ATTN}(f,R_A,Z_L)}{H_{ATTN}(f,R_1,Z_L)} \right|^2}{M}} \times \frac{1}{H_{A2E}(f)\bullet p_0} \right).$$

8. The method of claim 6 wherein the sound pressure level is calculated as:

$$10\log_{10}\left(\frac{\sum_{f}\left|Y_X(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\bullet\frac{H_{ATTN}(f,R_A,Z_L)}{H_{ATTN}(f,R_1,Z_L)}\right|^2}{\sum_{f}\left|Y_{XREF}(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\right|^2}\right)+N.$$

9. The method of claim 6 wherein the sound pressure level is calculated as:

$$20\log_{10}\left(\sqrt{\frac{\sum_{f}\left|Y_X(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\bullet\frac{H_{ATTN}(f,R_A,Z_L)}{H_{ATTN}(f,R_1,Z_L)}\bullet H_{A-W}(f)\right|^2}{M}}\times\frac{1}{H_{A2E}(f)\bullet p_0}\right).$$

10. The method of claim 6 wherein the sound pressure level is calculated as:

$$10\log_{10}\left(\frac{\sum_{f}\left|Y_X(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\bullet\frac{H_{ATTN}(f,R_A,Z_L)}{H_{ATTN}(f,R_1,Z_L)}\bullet H_{A-W}(f)\right|^2}{\sum_{f}\left|Y_{XREF}(f)\bullet H_{D2E}(f)\bullet H_{BD}(f,R_1,A,Z_L)\right|^2}\right)+N.$$

11. The method of claim 1 wherein the transducer is an acoustic transducer.

12. The method of claim 1 wherein the transducer is a vibratory transducer.

13. The method of claim 1 wherein the transducer is characterized by a transfer function and further comprising inserting an inverse filter to equalize the transducer transfer function.

14. The method of claim 1 wherein the attenuator is characterized by a transfer function and further comprising inserting an inverse filter to equalize the attenuator transfer function.

15. The method of claim 1 wherein the solution for the characteristic impedance of the transducer is expressed as a function of frequency.

16. The method of claim 1 wherein the solution for the sensitivity of the transducer is expressed as a function of frequency.